DESIGNING SERVICES WITH MODEL-BASED METHODS

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ABSTRACT

Service design is a multidisciplinary human-centered field that involves a deep understanding of people, context, service providers, market strategies, and social practices, with the aim of designing service offerings that enable customers to co-create valuable experience. To deal with the complexity of service design challenges there is a need to develop methods dedicated to the service domain. Models have been considered an important contribution to service design as they portray complex realities, synthesize the relevant knowledge, and provide consistent communication between multidisciplinary teams. Activity-centered design seems well suited to support service design because it frames the understanding of customers with the activities they perform, their purpose and context. In this work we use an activity-centric framework to combine Multilevel Service Design, an interdisciplinary method to design services and Customer Experience Modeling, a method to capture and systematize customer experience. This approach is illustrated with an application to the design of a new multimedia service to improve the experience of watching soccer.

INTRODUCTION

Despite the economic dominance of services, service innovation is lacking methods and techniques to address its unique challenges (Bitner, Ostrom, and Morgan 2008). Service innovation involves complex combinations of people, technology, processes and information (Ostrom et al. 2010).

Dealing with this complexity requires dedicated methods. Models are considered crucial to successful service design (Holmlid and Evenson 2008), and a priority to enhance service innovation (Ostrom et al. 2010). Models are abstract representations of a portion of a system that explain its operation and underlying concepts (Ludolph 1998). These abstractions enable design teams to deal with the complexity of design problems.

Such complex and multifaceted problems can only be approached with the help of multidisciplinary teams (Van Bruggen and Kirschner 2003) whose members expertise can tackle the different and changing problem dimensions. Naturally this applies to service design, which applies the knowledge from different fields like, management, engineering, and design to be able to address service complexity.

Service design brings innovative service ideas to life (Ostrom et al. 2010). Service design is human-centered (Patrício and Fisk 2012), involving a deep understanding of people, context, service provider, market strategies, and social practices (Evenson

2008). Service design acts as a hub that brings together expertise from different fields (Moritz 2005) to design service offerings that enable customers to co-create valuable experience (Patrício and Fisk 2012).

In fact, enhancing the customer experience is at the center of service design efforts (Mager 2009; Moritz 2005), and is considered a sustainable competitive advantage for companies (Shaw and Ivens 2005; Pine and Gilmore 1998). Customer experience is the internal and subjective response customers have to any contact (direct or indirect) with a company (Meyer and Schwager 2007). Customer experience is therefore a holistic concept that is created both by the experience elements controlled by the company, such as, the physical environment and artifacts, and those that are outside company control, such as the purpose of shopping. (Verhoef et al. 2009).

Service design combines expertise from different fields to allow customers to co-create their desired experiences. However, the benefits of a team with multiple competences can be hindered by communication difficulties. Experts from different fields have their own vocabulary and way of approaching problems, thus making it difficult to share their knowledge and achieve a common ground of understanding. External representations, such as diagrammatic models, have been deemed capable of solving these issues according to research in several fields (Van Bruggen and Kirschner 2003; Larkin and Simon 1987; Simon 1996; Hevner et al. 2004; Ludolph 1998; Holmlid and Evenson 2008; Ostrom et al. 2010; Constantine and Lockwood 2001). The benefits of using models also include the ability to portray complex realities, eliminating irrelevant details, thus synthesizing the relevant knowledge, making missing information explicit, and representing implicit information explicitly (Cox 1999).

Models require suitable languages, or constructs, in which the problem and solution are defined and communicated (Hevner et al. 2004). They provide the vocabulary and symbols used to define problems and solutions, and should be appropriate to their domain (Scaife and Rogers 1996).

For the service context, activity-centered design, has been referred to as a suitable language (Sangiorgi 2009). Similar to other design approaches, Activity-centered design comprehends a deep understanding of customers, but frames this understanding with the activities they perform, their purpose and the context surrounding them (Norman 2005). In this way, we introduce an activity-centered design perspective that enables service designers to broaden their view of customer experience for the new service design process.

This paper presents an activity-centric framework that enables designers to capture, portray and evaluate customer experiences, and convey this gathered knowledge to the new service design process. Through a systematic and coherent set of models, with a clear set of concepts and notation, designers are able to map the entire service design process since data collection to the final service proposal, tracing each design decision to the relevant customer input. This work combines two interdisciplinary methods, Multilevel Service Design (Patrício et al. 2011) and Customer Experience Modeling (Teixeira et al. 2012). Multilevel Service Design (MSD) is a method for designing complex service systems that structures the service design process through

three hierarchical levels: the service concept, the service system and the service encounter. The MSD method starts with an in-depth understanding of the customer experience that feeds the design of the different levels of the service offering, using a set of interrelated models. Customer Experience Modeling (CEM) is a model-based approach that enables the systematic representation and evaluation of experience components, such as physical evidence, people (staff or customers) roles, technology-enabled-systems and customer experience requirements. By using an established set of models and notation adapted to the service domain, these approaches enhance communication and understanding between multidisciplinary stakeholders involved in the creation of the new service.

This paper illustrates this approach with an application to the design of a new multimedia service to enhance the experience of watching soccer. To build CEM's models we collected data through interviews, contextual inquiry and observation. By focusing on soccer fans activities, the way they are performed, and the context surrounding them we were able map a broad customer journey. This customer journey involved the interactions with different service providers, at different places and times, and with distinct experience requirements. It has then been possible to develop an innovative service concept and design the service system and each service encounter, following the MSD levels. This framework also successfully linked the work of interaction designers and software engineers working on the service prototype.

The next sections detail the importance of models, introduce service design and activity theory literature. Finally, we present the conceptual framework for integrating CEM in MSD and the practical application of this integration.

WHY MODELS?

Design activity involves the mental formulation of future states of affairs and the products of design activity are external representations of such possible futures (Goel and Pirolli 1992).

External representations, that include but are not limited to models, have been extensively studied in cognitive psychology. Models are used in several fields, such as mathematics and software engineering. However, as the objective of this work is to use models as a tool for structuring a process, enhancing communication and knowledge sharing, extant research in cognitive psychology can be particularly relevant. According to Zhang (Zhang 1997) external representations are defined as the knowledge and structures in the environment, as physical symbols, or objects, as opposed to internal representations that are the knowledge and structures in memory.

There are two kinds of external problem representations; sentential representations are the direct translation into formal language of the corresponding natural language sentence, and diagrammatic representations that have a series of components to describe a problem (Larkin and Simon 1987). Diagrammatic external representations provide several advantages over sentential ones; diagrams group together all information that is used together, thus reducing search time and diagrams support a large number of perceptual inferences, which are very easy for humans to compute.

This “computational offloading” (Scaife and Rogers 1996) is defined as the extent to which differential external representations reduce the amount of cognitive effort required to solve informational equivalent problems. Naturally this means that problems can be solved faster if a proper representation is used. Computational offloading effect is easily understandable if we think about a geometry problem, the visual information is easily perceived and recognized through our perception (our eyes), freeing mental resources to solve the problem. Also, for Scaife and Rogers (1996) external representations provide a graphical constraining, which means that they restrict, or enforce, the kinds of interpretations that can be made. Zhang (1997) considers that the most obvious property of an external representation is aiding the memory, and Cox (1999) adds a series of advantages related to external representation construction, like a self-explanation effect, directing attention to unsolved parts of the problem, re-ordering information in useful ways and translating information from one type to another.

Finally, external representation can scale up with the use of multiple external representations to portray complex problems, highlighting different types of information in each representation in detriment of others. This selective highlighting supports the user by pointing him the relevant information for a particular task (Brna, Cox, and Good 2001).

Therefore diagrammatic external models, have intrinsic qualities that are invaluable when dealing with the complex design problems posed by services. Their abstraction and systematization properties make these problems manageable. Their concepts, notation and relationships enable multidisciplinary teams to reach a common understanding of the relevant concepts, fostering communication. However, to take full advantage of external representations the complexity, understandability and specificity of the concepts used must be adapted to the users expertise (Van Bruggen and Kirschner 2003; Scaife and Rogers 1996). For example, for someone who doesn’t have the required knowledge, an architectural map is a set of meaningless symbols (Scaife and Rogers 1996). A larger and more specific set of concepts and relations can be counterproductive as it will increase the cognitive effort to apprehend it (Van Bruggen and Kirschner 2003). Indeed a simpler set of concepts, adapted to the context at hand enhances learning.

DESIGNING SERVICES

While product design boasts an extensive literature, the design of services is still not a well-established practice. Indeed, services tend to have distinguishable characteristics when compared with products; they cannot be touched, seen or kept as they are intangible, they are simultaneously produced and consumed, thus preventing their storage, or accumulation, and they are heterogeneous because they depend to a large extent on human actions (Fisk, Grove, and John 2000). These characteristics make service problems wicked ones (Rittel and Webber 1973), with service provision suffering from an increased propensity to failure (Shostack 1984). In this context wicked does not mean they are ethically deplorable, instead it means they are tricky, or aggressive (Rittel and Webber 1973). Wicked problems are characterized by not

having a right, or wrong, solution, only good or bad ones. As such, there is no way to determine if the solution achieved is the best possible, neither there is a definitive stopping point for the problem resolution. Also, wicked problems are mutable, i.e., they change over time, along with their associated goals and requirements.

Services complexity also increased in the last decades, as technology broke down restrictions to information access and enabled other ways/channels to reach/interact with customers. Improved information access made possible new configurations of resources (Chesbrough and Spohrer 2006), while the focus shifted from tangible resources to intangible ones (Spohrer et al. 2007) and the ways they co-create value (Vargo and Lusch 2004). As a new economy emerged, even traditional manufacturing companies became "service infused" as they learned to differentiate from their competition by providing services along with their products (Edvardsson, 2000).

Service design is a field committed to the challenges posed by service's distinctive characteristics that aims to develop useful, usable, desirable, effective and efficient service experiences (Moritz 2005). Thus, service design has a strong customer focus and resorts to contributions from multiple fields, assembling a set of multidisciplinary techniques to create new, or improve existing services.

Service design has acknowledged the importance of experience (Mager 2009) and aims to put forth services focused on the customers (Moritz 2005). However, customer experiences cannot be exactly designed as only some elements, such as the physical environment, or some of the staff interactions, can be accounted for. Others, like the customer mood, are unpredictable and do not depend on the service provider. The context and the activities are the service elements designers can effectively put forward to attain desired experiences (Zomerdijk and Voss 2009). These activities and its context are the centerpiece of activity theory and activity-centered design.

Activity theory is a philosophical and cross-disciplinary framework for describing and characterizing the structure of human activity of all kinds (Constantine 2009; Kuutti 1996). It considers activities as the basic unit of analysis. The distinctive feature of activities is that they comprise the meaningful context around them, considering that any human action is impossible to understand without that context (Kuutti 1996). Activity theory tenets have been discussed and applied by interaction designers to develop technologies considering its intended use and context (Kaptelinin and Nardi 2006; Norman 2005; Kuutti 1996; Constantine 2009). So, an activity-centric design doesn't focus on goals and preferences of individuals, but on behavior surrounding tasks (Saffer 2010).

A cross-disciplinary review shows that this subject is discussed also in management and marketing literature, with authors pointing out that a focus on the customer's activities, or *job*, is preferable to a focus on the customer per se (Ulwick 2005; Bettencourt 2010). From a services viewpoint, activity theory has been suggested as a suitable approach for service design as it takes into account the wider context of action in service encounters (Sangiorgi 2009). Multilevel Service Design (Patrício et al. 2011) applied Human Activity Modeling (Constantine 2009), an interaction design approach to capture and represent the context surrounding an activity, to structure user activities in a service design method. Customer Experience Modeling (Teixeira et al.

2012) used both Human Activity Modeling (HAM) concepts and notation, and Multilevel Service Design (MSD) hierarchical structure, to capture and systematize customer experience information.

MSD is a service design method that structures the development of service offerings in three hierarchical levels: the service concept, the service system and the service encounter. MSD divided these levels for both customer experience and service design, considering that understanding customer experience precedes service design. MSD presented a thorough method to design services, from data collection to service prototyping, while developing a set of integrated models to describe the service design process; the customer value constellation, the service system navigation and architecture and the service experience blueprint. Customer Experience Modeling (CEM) presented the models to describe the customer experience levels; which includes the value constellation experience, the service experience and the service encounter experience. CEM captures customer experience holistic nature through HAM concepts and notation, thus providing a systematic portrayal of the experience context, considering physical artifacts, technology-enabled systems, and actors involved in each activity performed by the customer. It also includes Customer Experience Requirements (Patrício, Fisk, and Cunha 2008) to guide the design process.

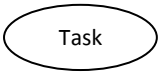
While CEM followed MSD structure, contributing with a set of models dedicated to customer experience, this contribution had yet to be included in MSD in a single coherent effort. Using activities as the binding concept we demonstrate how CEM can fit into the MSD method and enable service designers to capture and portray customer experience and systematically link it to the service offering elements they design.

INTEGRATING CEM IN MSD

To establish a coherent set of models, a common language must be applied to all of them. This language must be adapted to the relevant domain. To embed CEM in MSD we employed a modified version of Human Activity Modeling notation. This modification is necessary to adapt the concepts and notation to the service domain, as HAM was originally developed as a framework to support the design of interactive systems. This notation was already introduced with CEM, but we have now added the concept of task to better fit the hierarchical structure defined in MSD. Table 1 presents the notation for this adapted notation.

Following the Bridge Model (Dubberly, Evenson, and Robinson 2008) adapted to service design (Patrício and Fisk 2012) we start by understanding the customer experience through qualitative data collection methods, such as, open-ended interviews, focus groups, observations, and contextual inquiry (Beyer and Holtzblatt 1998).

Table 1- Notation for CEM and MSD models.

Notation	Description
	Any artifact employed within an activity (Constantine, 2009).
	Non-human system (software or hardware) interacting with the customer.
	Activity participant interacting with the customer (or the customer himself).
	Perceived attributes of the interaction with a service provider that contributes to satisfaction and usage of the service (Patrício et al., 2009).
	Collection of actions or tasks undertaken for some purpose (Constantine, 2009).
	Action by an actor interacting with the service.

Quantitative methods can be applied to validate potentially interesting aspects raised by the qualitative approach. We then model the customer experience according to Customer Experience Modeling. These models follow the hierarchical levels defined by Multilevel Service Design; value constellation experience, service experience and service encounter experience. The value constellation experience level is focused on the overall customer experience while performing a broad customer activity, such as buying a house, or having fun. These are activities with a wide scope, involving many smaller actions or tasks, supported by several service providers. This overall activity is selected according to the service design project objectives and portrays all the related activities, independently of the service provider that supports them. The service experience level focuses on the tasks the customer performs when using a service from a single provider. This level portrays the customer experience enabled by the selected service provider. Finally, the service encounter experience level systematizes the customer experience on each single service encounter. As we can see this is a customer-centric hierarchical approach that starts by analyzing the context of an activity performed by a customer, then focuses on the experience with a single service provider, and again in the experience in each of the possible service encounters with this provider.

The next step is designing the new service offering to improve the customer experience by applying the models Multilevel Service Design. This step follows the three hierarchical levels but, this time, applied in the design of the service offering. In the first level of MSD, the customer value constellation, we define the service concept

by positioning it within the network of service offerings from multiple service providers that the customer uses to support the overall activity. Focusing on the customer activities we associate them with the respective service providers. The second level, the service system, focuses on the implementation of the concept by a service provider, and the orchestration of channels, processes, physical evidence, technology and people. The third and last level, the service encounter is centered on a single encounter between the customer and the service provider, through a single interface.

The inclusion of CEM in MSD is intended to support the "creative transition from understanding the customer experience to defining the service solution" (Patrício and Fisk 2012). Naturally any approach can claim to systematize this transition, as it is an inherently subjective and creative step. This is where a multidisciplinary team must conceive a service concept that enhances the customer experience. The models, both from the customer experience and service design side, support this process. They capture, systematize and highlight the relevant knowledge and decisions of the design team, enabling traceability between the desired customer experience elements and the service offering. Also, establishing a clear set of contents and notation for building the models fosters communication between multidisciplinary design teams. The service concept itself and its implementation are dependent on the insights of the design team.

PRATICAL APPLICATION

To illustrate this framework we applied it to a Portuguese multimedia service provider whose most recent marketing strategy involved a closer connection to soccer, the number one sport in Portugal. To potentiate this approach and involve the different services provided by the company (cable TV and Internet provider) a multi-interface service was developed to improve the customer experience of watching soccer.

To build both CEM's and MSD's models we collected data through interviews, contextual inquiry and observation. Sampling and data analysis followed Grounded Theory precepts (Charmaz 2006; Corbin and Strauss 2008). Figure 1 shows the application of CEM in the context of MSD to this case, through the three levels of customer experience and service design.

The data collection has focused on understanding how people perform and perceived the activity "Viewing Sports". Following an activity-centric approach, our objective was not only to collect data about services already offered by the service provider, but broaden the scope to encompass the full range of providers and contextual elements related to that activity. This is reflected in the first level of Figure 1, where we can see, on the left, CEM's model portraying the experience requirements and contextual elements related with Seeing Sports. The customer experience requirements are:

- Comfort: physical and mental comfort;
- Sharing: conveying one's opinion, or multimedia content, to friends or relatives;
- Information: Availability and timely access to relevant information;
- Viewing quality: technical quality of the image and audio;

- Enthusiasm: excitement or elation.

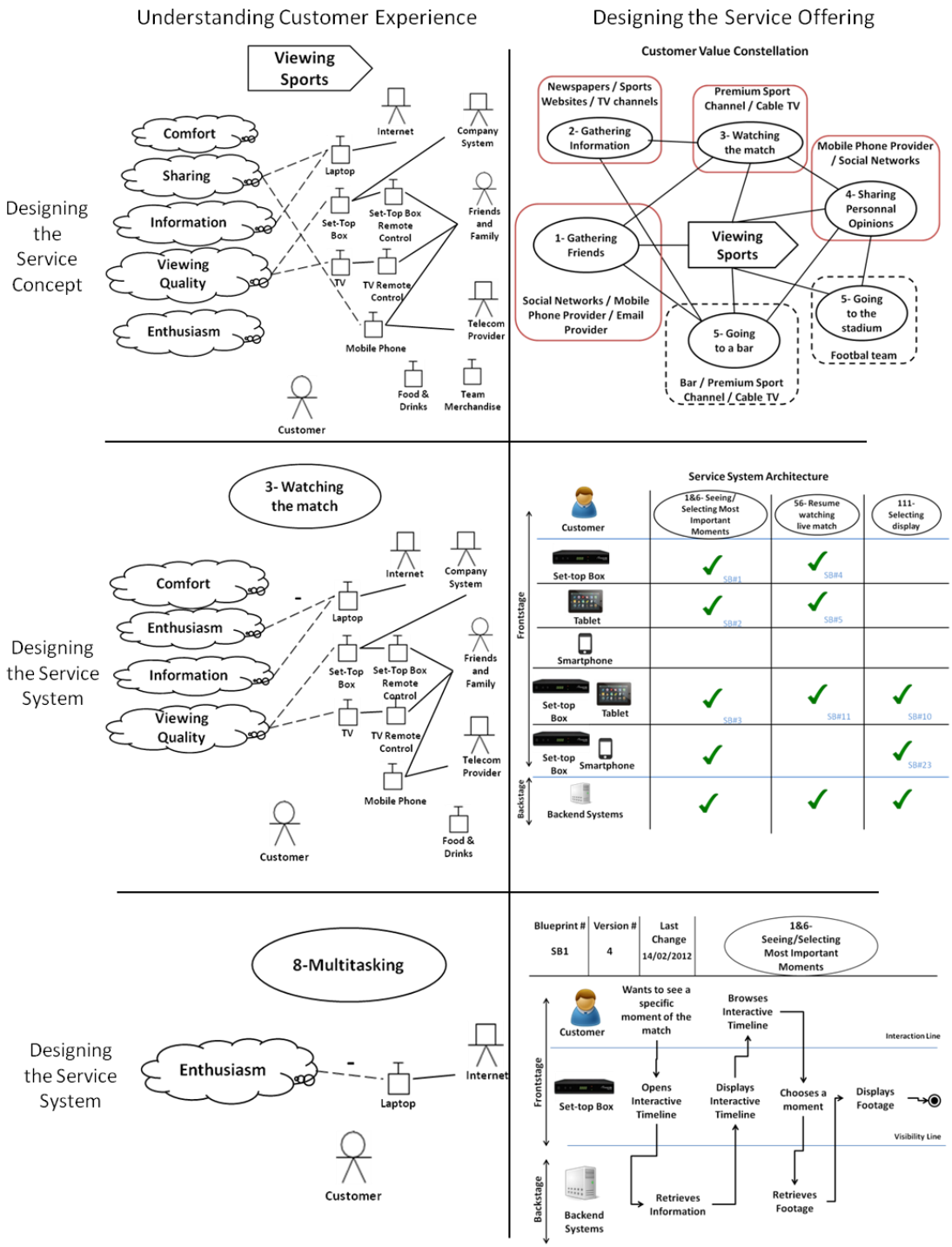


Figure 1 – Designing a new service for watching soccer with MSD method with CEM models detailing the customer experience.

The contextual elements are mostly technological related artifacts like laptop, TV or set-top box. In the middle level we detailed the task "Watching the Match", and we see that sharing ceases to be important. This occurs since most of the opinion sharing occurs before and after the match. One interesting fact is the relation of enthusiasm with the use of a laptop. This is in fact a negative relation, as the less enthusiasm the

more watchers will use the laptop to do other things. This is detailed on the last level with the task "Multitasking".

On the right of Figure 1, in the first level, the customer value constellation maps the tasks related with viewing sports and the services that support those tasks. Based on the analysis of the customer experience the design team developed a service concept that supports the tasks of information gathering, watching the match, sharing personal opinions and gathering friends. This way the designed service had three main components:

- embedded social network capabilities to share comments and media during the game;
- enhanced viewing experience by introducing an interactive and configurable match timeline;
- complete information before, during and after the match, with advanced player and team statistics, interviews and standings.

The middle level of the service offering design shows the service system architecture for the new service. This model shows which task is implemented in each interface. As we can see this is a complex service with many interfaces; set-top box, tablet, smartphone and several combinations of these. The service system architecture supports the design of a coherent offering throughout these interfaces. Each combination interface/task is specified in a Service Experience Blueprint (Patrício, Fisk, and Cunha 2008) in the third and last level. In Figure 1 it is portrayed the task "Seeing/selecting most important moments" for the set-top box interface.

In this example, there is no direct correspondence between the tasks shown in CEM's and MSD's models since this is a new service that involve new tasks. Nowadays customers are passive viewers of a match so there is only the "Watch the match" task. Whereas the new service concept enables new ways to enjoy a match, interacting with the content through different displays and devices, so new tasks arise like "Selecting display". However, comparable tasks should be analyzed together, as customer experience information should support design decision. This way, as the requirements for watching a match are comfort, enthusiasm, information and viewing quality, the designed service is a multi-interface one to adapt to each customer preferences, it provides ways to keep attention and excitement always high, while making available all the relevant information and maintaining high technical standards for the video and audio feed.

This is a practical application of MSD method with CEM models systematizing customer experience. These models were used in the design process of a new service, with a multidisciplinary team of managers, software engineers and interaction designers. While they provided a suitable means of communication among the team members, ensuring a uniform understanding of concepts and a common language for discussion, they also anchored each expert development. This included data models and interaction sketches.

CONCLUSION

Designing services requires methods that cope with a complex and multidisciplinary reality. Models can support service design efforts both by systematizing and enhancing the traceability of the design process. Models also enable multidisciplinary teams to reach a common conceptual understanding and work with a common notation.

Previous service design methods have employed models and activity-centric notation to describe their processes. Multilevel Service Design has defined a comprehensive method for designing services, including a set of models organized through three hierarchical levels that detail the service design process. Customer Experience Modeling complemented this method by developing a set of models to capture and systematize customer experience.

This work showed how these contributions can work towards a model-based process to design innovative services. The integration of CEM's models with MSD's models provides designers with a systematized and clear process for designing services that enable customers to co-create their desired experiences. Following a model-based approach, designers can manage the complexity of customer experience and service design, document their design process, and trace each design decision to the relevant experience information. Model-based methods also provide a multidisciplinary design team with a set of common concepts and notation that foster communication.

Additional work is still needed to improve these models, by including different segments of customers and business goals. The implementation of this model-based approach in other service settings would also provide insights on the generalizability of these methods.

REFERENCES

Bettencourt, Lance. 2010. *Service innovation how to go from customer needs to breakthrough services*. New York: McGraw-Hill.

Beyer, Hugh, and Karen Holtzblatt. 1998. *Contextual design: defining customer-centered systems*. San Francisco, Calif.: Morgan Kaufmann.

Bitner, M. J., A. L. Ostrom, and F. N. Morgan. 2008. Service blueprinting: A practical technique for service innovation. *California Management Review* 50 (3):66-95.

Brna, P., R. Cox, and J. Good. 2001. Learning to think and communicate with diagrams: 14 questions to consider. *Artificial Intelligence Review* 15 (1):115-134.

Charmaz, Kathy. 2006. *Constructing grounded theory: a practical guide through qualitative analysis*. London; Thousand Oaks, Calif.: Sage Publications.

Chesbrough, Henry, and Jim Spohrer. 2006. A Research Manisfesto for Services Science. *Communications of the ACM* 49 (7):35-40.

Constantine, L. L., and L. A. D. Lockwood. 2001. Structure and style in use cases for user interface design. *Object Modeling and user Interface Design* CCCT:245-279.

Constantine, Larry. 2009. Human Activity Modeling: Toward A Pragmatic Integration of Activity Theory and Usage-Centered Design. In *Human-Centered Software Engineering: Software Engineering Models, Patterns and Architectures for HCI*. London: Springer.

Corbin, Juliet M., and Anselm L. Strauss. 2008. *Basics of qualitative research: techniques and procedures for developing grounded theory*. Los Angeles, Calif.: Sage Publications, Inc.

Cox, R. 1999. Representation construction, externalised cognition and individual differences. *Learning and instruction* 9 (4):343-363.

Dubberly, H., S. Evenson, and R. Robinson. 2008. The Analysis-Synthesis Bridge Model. *Interactions* 15 (2):57-61.

Evenson, Shelley. 2008. A Designer's View of SSME. In *Service Science, Management and Engineering: Education for the 21st Century*, edited by B. Hefley and W. Murphy: Springer.

Fisk, Raymond P., Stephen J. Grove, and Joby John. 2000. *Interactive services marketing*. Boston: Houghton Mifflin.

Goel, V., and P. Pirolli. 1992. The structure of design problem spaces. *Cognitive science* 16 (3):395-429.

Hevner, A.R., S.T. March, J. Park, and S. Ram. 2004. Design science in information systems research. *Mis Quarterly* 28 (1):75-105.

Holmlid, S., and S. Evenson. 2008. Bringing Service Design to Service Sciences, Management and Engineering. *SERVICE SCIENCE, MANAGEMENT AND ENGINEERING EDUCATION FOR THE 21ST CENTURY*:341-345.

Kaptelinin, Victor, and Bonnie A. Nardi. 2006. *Acting with technology : activity theory and interaction design*, *Acting with technology*. Cambridge, Mass.: MIT Press.

Kuutti, Kari. 1996. Activity Theory as a potential framework for human- computer interaction research. In *Context and consciousness : activity theory and human-computer interaction*, edited by B. A. Nardi. Cambridge, Mass.: MIT Press.

Larkin, J.H., and H.A. Simon. 1987. Why a diagram is (sometimes) worth ten thousand words. *Cognitive science* 11 (1):65-100.

Ludolph, Frank. 1998. Model-Based User Interface Design: Successive Transformations of a Task/Object Model. In *User interface design: bridging the gap from user requirements to design*, edited by L. E. Wood. Boca Raton: CRC Press.

Mager, Birgit. 2009. Service Design as an Emerging Field. In *Designing Services With Innovative Methods*, edited by S. Miettinen and M. Kivisto. Helsinki: Helsinki University of Art and Design.

Meyer, Christopher, and Andre Schwager. 2007. Understanding Customer Experience. *Harvard Business Review.* 85 (6):137-137.

Moritz, Stefan. 2005. Service Design: Practical access to an evolving Field. Cologne, Germany: Köln International School of Design.

Norman, D. A. 2005. Human-centered design considered harmful. *Interactions* 12 (4):14-19.

Ostrom, A.L., M.J. Bitner, S.W. Brown, K.A. Burkhard, M. Goul, V. Smith-Daniels, H. Demirkan, and E. Rabinovich. 2010. Moving forward and making a difference: research priorities for the science of service. *Journal of Service Research* 13 (1):4-36.

Patrício, Lia, Raymond Fisk, João Falcão e Cunha, and Larry Constantine. 2011. Multilevel Service Design: From Customer Value Constellation to Service Experience Blueprinting. *Journal of Service Research* 14 (2):180-200.

Patrício, Lia, Raymond Fisk, and JoãoFalcão e Cunha. 2008. Designing Multi-Interface Service Experiences: The Service Experience Blueprint. *Journal of Service Research* 10 (4):318-34.

Patrício, Lia, and Raymond P. Fisk. 2012. Creating New Services. In *Serving Customers: Global Services Marketing Perspectives*, edited by R. P. Fisk, R. Russell-Bennett and L. C. Harris: Tilde University Press.

Pine, B. J., II, and J. H. Gilmore. 1998. Welcome to the experience economy. *Harvard Business Review* 76 (4):97-105.

Rittel, H.W.J., and M.M. Webber. 1973. Dilemmas in a general theory of planning. *Policy sciences* 4 (2):155-169.

Saffer, Dan. 2010. *Designing for interaction*. Berkeley, CA; London: New Riders; Pearson Education [distrib.].

Sangiorgi, Daniela. 2009. Building Up a Framework for Service Design Research. In *8th European Academy of Design Conference*. The Robert Gordon University, Aberdeen, Scotland.

Scaife, Mike, and Yvonne Rogers. 1996. External cognition: how do graphical representations work? *Int. J. Human–Computer Studies* 45:185-213.

Shaw, Colin, and John Ivens. 2005. *Building Great Customer Experiences*: Palgrave Macmillan.

Shostack, G. L. 1984. Designing services that deliver. *Harvard Business Review* 62 (1):133-139.

Simon, H.A. 1996. *The sciences of the artificial*: MIT Press.

Spohrer, J., P. P. Maglio, J. Bailey, and D. Gruhl. 2007. Steps Toward a Science of Service Systems. *Computer - IEEE Computer Society* 40 (1):71-77.

Teixeira, Jorge Grenha, Lia Patrício, Nuno Nunes, Leonel Nóbrega, Raymond P. Fisk, and Larry Constantine. 2012. Customer Experience Modeling: From Customer Experience to Service Design. *Journal of Service Management* 23 (3).

Ulwick, Anthony W. 2005. *What customers want : using outcome-driven innovation to create breakthrough products and services*. New York: McGraw-Hill.

Van Bruggen, JM, and P.A. Kirschner. 2003. Designing external representations to support solving wicked problems. *Arguing to learn: Confronting cognitions in computer-supported collaborative learning environments*:177-204.

Vargo, S. L., and R. F. Lusch. 2004. Evolving to a new dominant logic for marketing. *Journal of Marketing* 68 (January) (1):1-17.

Verhoef, Peter C., Katherine N. Lemon, A. Parasuraman, Anne Roggeveen, Michael Tsiros, and Leonard A. Schlesinger. 2009. Customer Experience Creation: Determinants, Dynamics and Management Strategies. *Journal of Retailing* 85 (1):31-41.

Zhang, J. 1997. The nature of external representations in problem solving. *Cognitive science* 21 (2):179-217.

Zomerdijk, Leonieke, and Christopher Voss. 2009. Service Design for Experience-Centric Services. *Journal of Service Research* 13 (1):67-82.